

AMENDMENTS TO THE CLAIMS

1. (Currently Amended) A medical instrument comprising:
a guide wire that is inserted at one end through a vascular lumen narrowed by deposits and is extended at the other end out of a patient's body;
a rotating cutter that is rotatably and slidably guided ~~on~~over said guide wire and is driven to cut away the deposits in said narrowed vascular lumen;
a hollow drive shaft that is operatively connected to said rotating cutter and through which said guide wire is inserted;
a fixed sheath having inserted therein said drive shaft; and
a controller having a drive assembly for rotating said drive shaft;
wherein said rotating cutter is driven to perform intravascular treatment to establish patency of said narrowed vascular lumen or to distend said vascular lumen;
~~characterized in that~~wherein:
said rotating cutter contains on its surface a plurality of independent microscopic cutting edges formed integrally with a mother material of said cutter.

2. (Currently Amended) The medical instrument of claim 1, ~~characterized in that~~wherein said rotating cutter can be compressed axially thereof for plastic deformation in a direction in which to enlarge the diameter of said cutter in the case of further distending said narrowed vascular portion after removal therefrom of deposits by said cutter.

3. (Currently Amended) A medical instrument comprising:
a guide wire that is inserted at one end through a vascular lumen-narrowed by deposits and is extended at the other end out of a patient's body;
a rotating cutter that is rotatably and slidably guided ~~on~~over said guide wire and is driven to cut away the deposits in said narrowed vascular lumen;
a hollow drive shaft that is operatively connected to said rotating cutter and through which said guide wire is inserted;
a fixed sheath having inserted therein said drive shaft;
a controller having a drive assembly for rotating said drive shaft; and

a secondary treatment rotating cutter whose cutting surface has an outside diameter larger than the maximum outside diameter of the cutting surface of said rotating cutter (an initial treatment rotating cutter);

~~characterized in that wherein:~~ said initial treatment rotating cutter and said secondary treatment rotating cutter contain on their respective surfaces great numbers of independent microscopic cutting edges formed integrally with mother materials of said cutters; ~~and~~

and wherein in the case of further distending said narrowed vascular portion after cutting treatment of said narrowed vascular portion by said initial treatment rotating cutter, said secondary treatment rotating cutter is coupled to said initial treatment rotating cutter on that portion of said guide wire extending out of the patient's body in such a manner that the cutting edges of both of said rotating cutters are configured with sufficiently ~~small-narrow~~ and appropriately ~~spaced apart intervals~~ in a direction in which to remove deposits from said narrowed vascular portion.

4. (Currently Amended) The medical instrument of claim 1 ~~or 3~~, ~~characterized in that wherein~~ said microscopic cutting edges ~~are comprise~~ microscopic asperities formed on the peripheral surfaces of said cutters, and the heights, depths, widths and lengths of said asperities are chosen such that chippings of said deposits cut by said cutters are 10 microns or below in size.

5. (Currently Amended) The medical instrument of claim 4, ~~characterized in that wherein~~ said asperities have elongated grooves configured to extend in the direction of rotation of said cutters, gradually get deeper rearwardly in said direction and terminate at the deepest point at which said grooves rise ing steeply there, ~~and or~~ protrusive cutting edges configured to extend upright from said deepest point of said elongated grooves and jut out of the cutter surface.

6. (Currently Amended) The medical instrument of claim 1 ~~or 3~~, ~~characterized in that wherein~~ said microscopic cutting edges are formed on the mother material surface of each of said cutter by laser machining, electric discharge machining, chemical etching, press work, pressure welding, or cutting work.

7. (Currently Amended) The ~~In~~ the medical instrument of claim 4 ~~or 5~~, ~~characterized in that wherein~~ cutting surface forming areas of said plurality of microscopic asperities forming said microscopic cutting edges are disposed in overlapping relation with one another.

8. (Currently Amended) The medical instrument of claim 5, ~~characterized in that~~wherein said plurality of microscopic asperities forming said microscopic cutting edges ~~are composed of~~comprise asperities whose cutting surfaces face in a normal direction of rotation of said cutters and asperities whose cutting surfaces face in a direction opposite to said normal direction of rotation.

9. (Currently Amended) The medical instrument of ~~any one of claims 1 to 3, characterized in that~~wherein the cutter surface is a mirror-finished surface.

10. (Currently Amended) The medical instrument of ~~any one of claims 1 to 3, characterized in that~~wherein said cutter surface is coated with a plated layer.

11. (Currently Amended) The medical instrument of claim 1 ~~or 2, characterized in that~~wherein said rotating cutter is adapted to be compressed axially by a jig preplaced coaxially with or in proximity to said drive shaft to undergo plastic deformation in a radial direction in which to enlarge the diameter of said rotating cutter.

12. (Currently Amended) The medical instrument of claim 3, ~~characterized in that~~wherein said secondary treatment rotating cutter is adapted to be press-fitted ~~or coating-fitted~~ capped, by a jig preplaced coaxially with or in proximity to the drive shaft, into or onto the initial treatment rotating cutter for engagement therewith.

13. (Currently Amended) The medical instrument of claim 11 ~~or 12, characterized in that~~wherein said jig has a one-hand operated, squeeze-type lever mechanism utilizing a force-multiplying mechanism by a lever or cam.

14. (Currently Amended) The medial instrument of claim 1, ~~characterized in that~~wherein said controller has a mechanism for pushing said rotating cutter out forwardly from a distal end of said fixed sheath toward the affected area and a mechanism for retracting said rotating cutter, and that these mechanisms are actuated by a squeeze-type operating lever provided with an auto-return mechanism and a position retaining mechanism.

15. (Currently Amended) The medical instrument of claim 1 ~~or 14, characterized in that~~wherein said controller is provided with a vibrating mechanism for reciprocating said rotating cutter in a direction along said guide wire.

16. (Currently Amended) The medical instrument of claim 1, ~~14, or 15, characterized in that~~wherein said controller has built therein a drive assembly for rotating said drive shaft, and wherein ~~that~~ said drive assembly has a motor provided with a hollow rotary shaft through which said drive shaft is insertable.

17. (Currently Amended) The medical instrument of claim 1, ~~14, 15, or 16, characterized in that~~wherein said controller is provided with a drive shaft chucking mechanism and a soft-sheath attaching/detaching mechanism.